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(54) Bicycle gear shift unit

(57) A bicycle gear shift unit permits a bicycle rider to effect a gear change without releasing the bicycle handlebars or brake handle. The shift unit includes a stationary base (42'') affixed to the handlebars and a rotatable base (40'). Attached to the rotatable base (40') is the hand-grip (14). A clutch mechanism between the rotary base and the stationary base allows the hand grip to be positioned without effecting the cable (100). The inner cable (102) is connected to a disc (90) which is keyed to the bolt (80') fast with the clutch mechanism (224). A brake-operating lever (22) is pivoted to hand-grip (14). In Figs. 5 and 6 (not shown) a telescoping arrangement is illustrated for adjusting the handle bars.

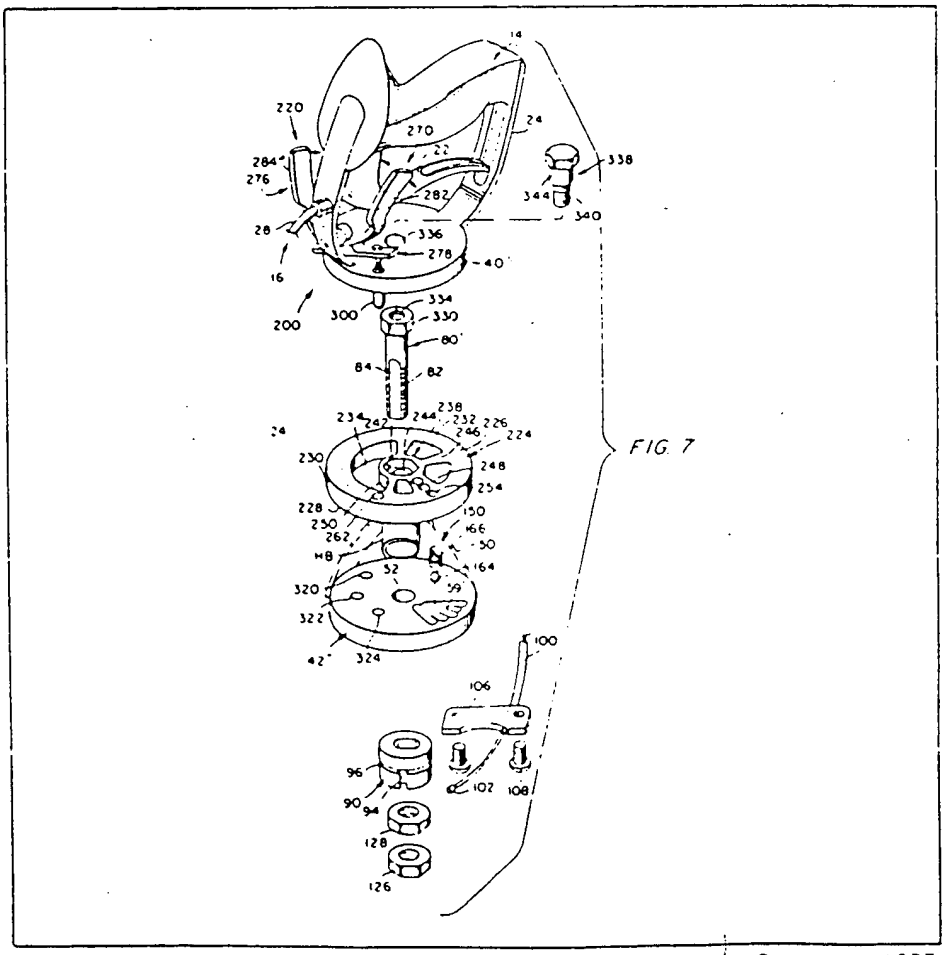


FIG. 7

This print embodies corrections made under Section 117(1) of the Patents Act 1977.

GB 2 135 028 A

FIG. 1.

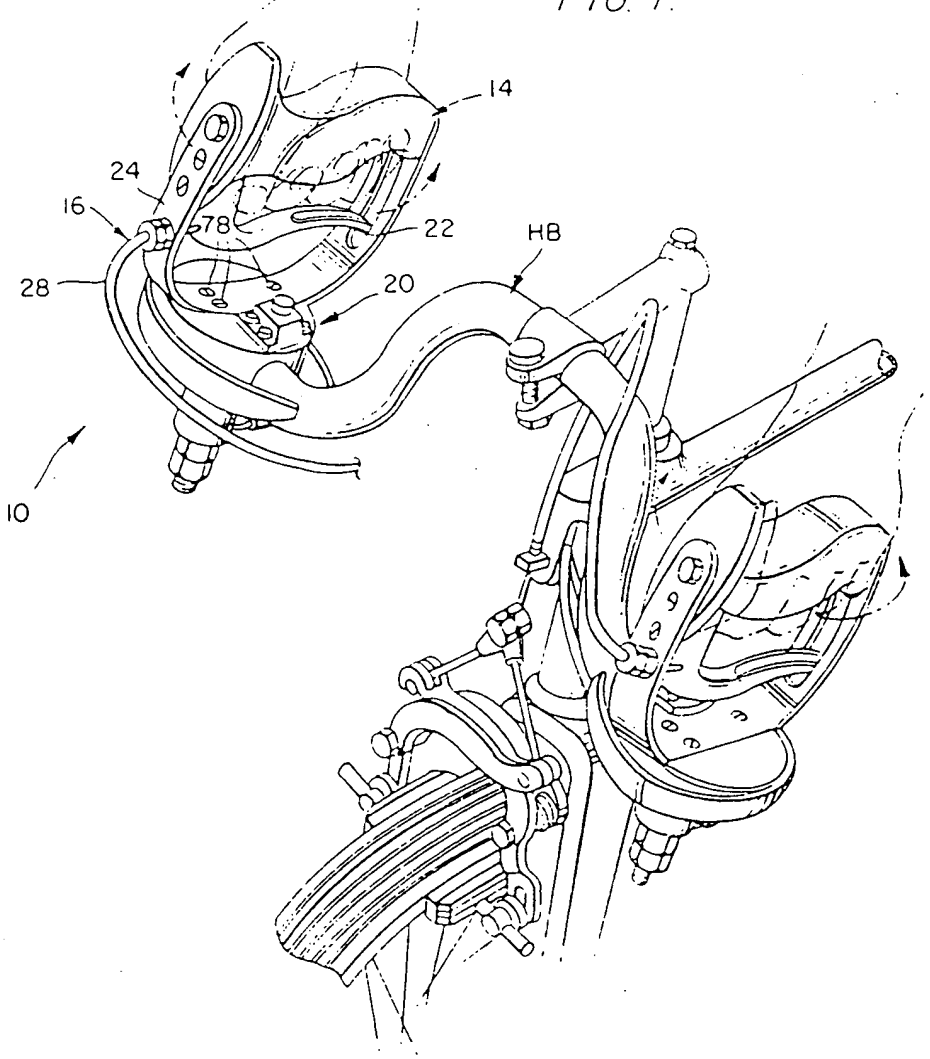

14
24
16
78
22
HB
28
20
10

FIG. 2.

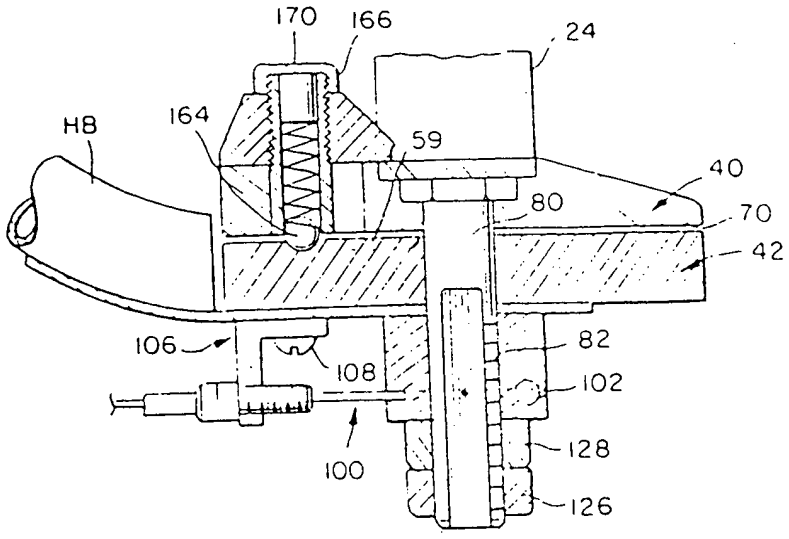

170
166
24
HB
164
59
40
80
70
42
106
108
82
102
100
128
126

FIG. 3.

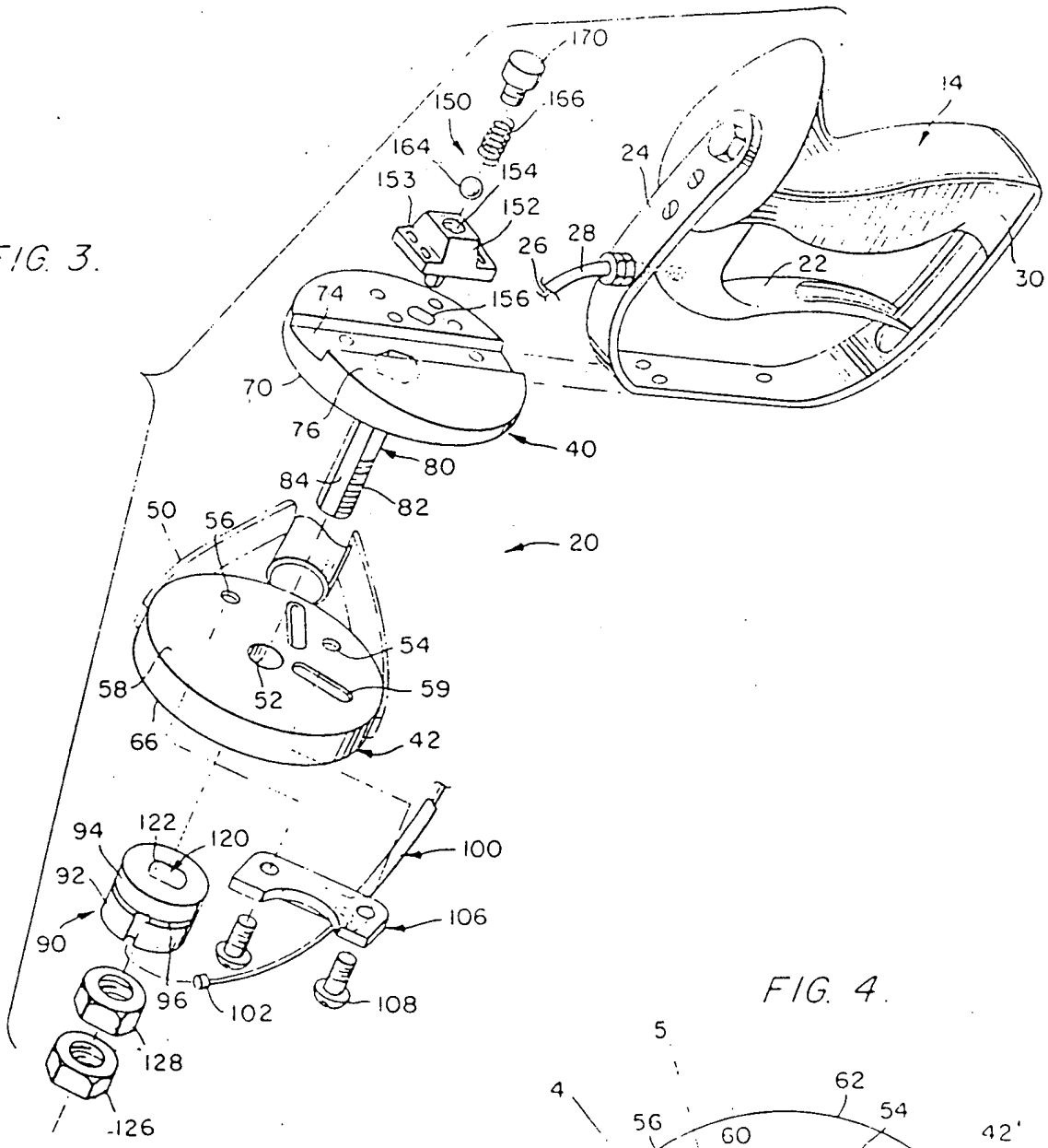

170
150
156
164
154
153
152
14
24
26
28
22
30
74
156
70
76
40
80
84
82
50
56
20
54
58
52
59
66
42
94
122
120
100
92
106
90
96
102
108
128
126

FIG. 4.

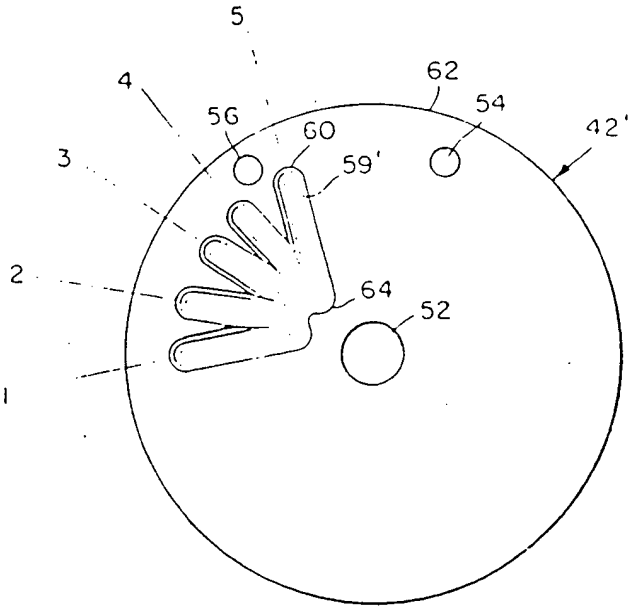

5
4
62
54
56
60
42'
3
59'
2
64
52
1

FIG. 5.

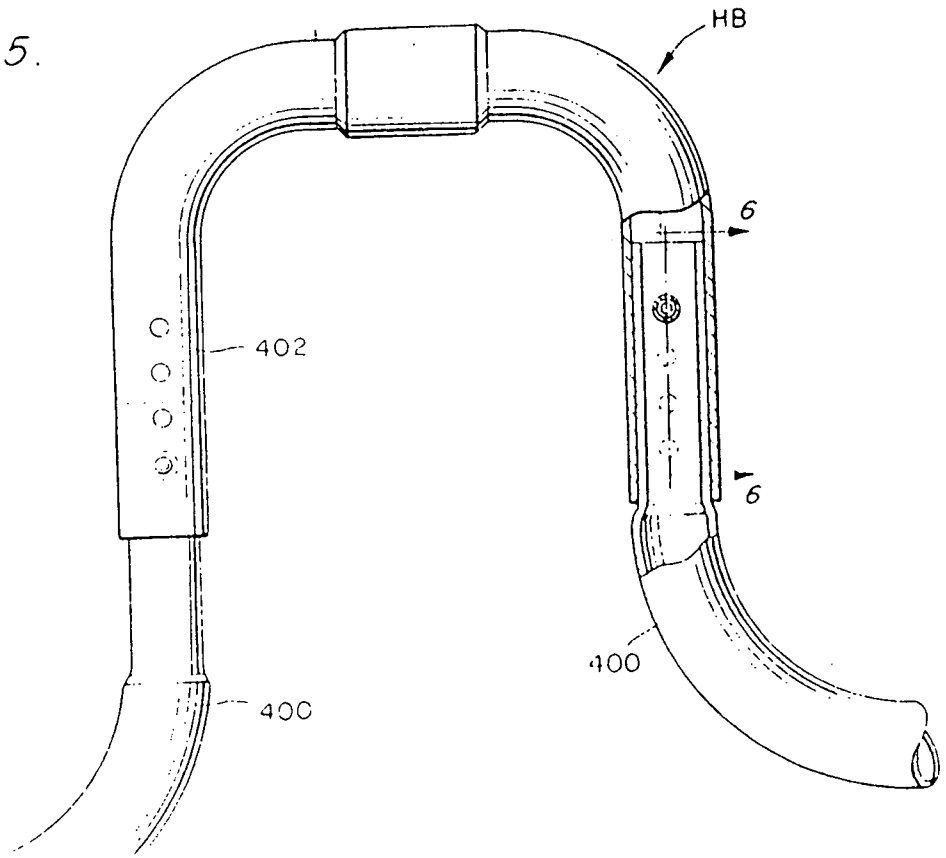


FIG. 6.

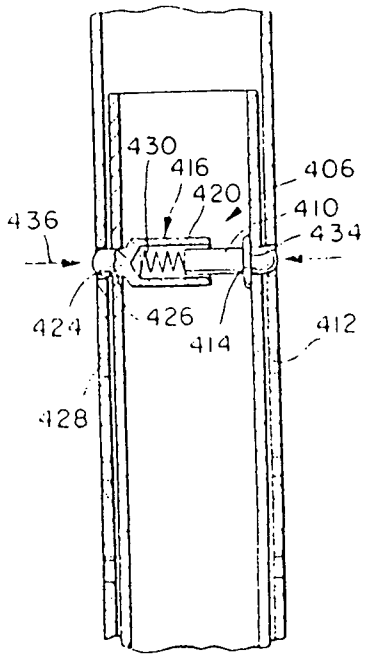


FIG. 8.

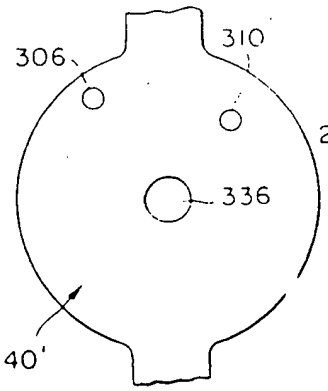


FIG. 9.

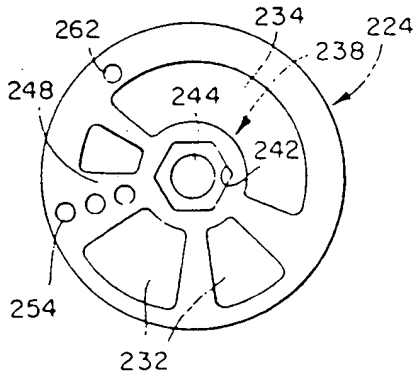
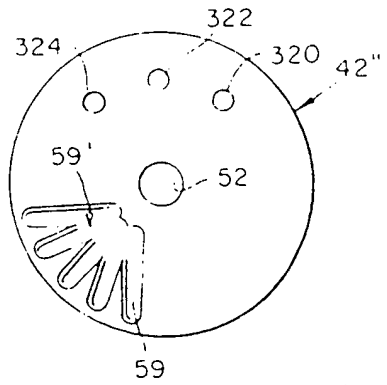


FIG. 10.



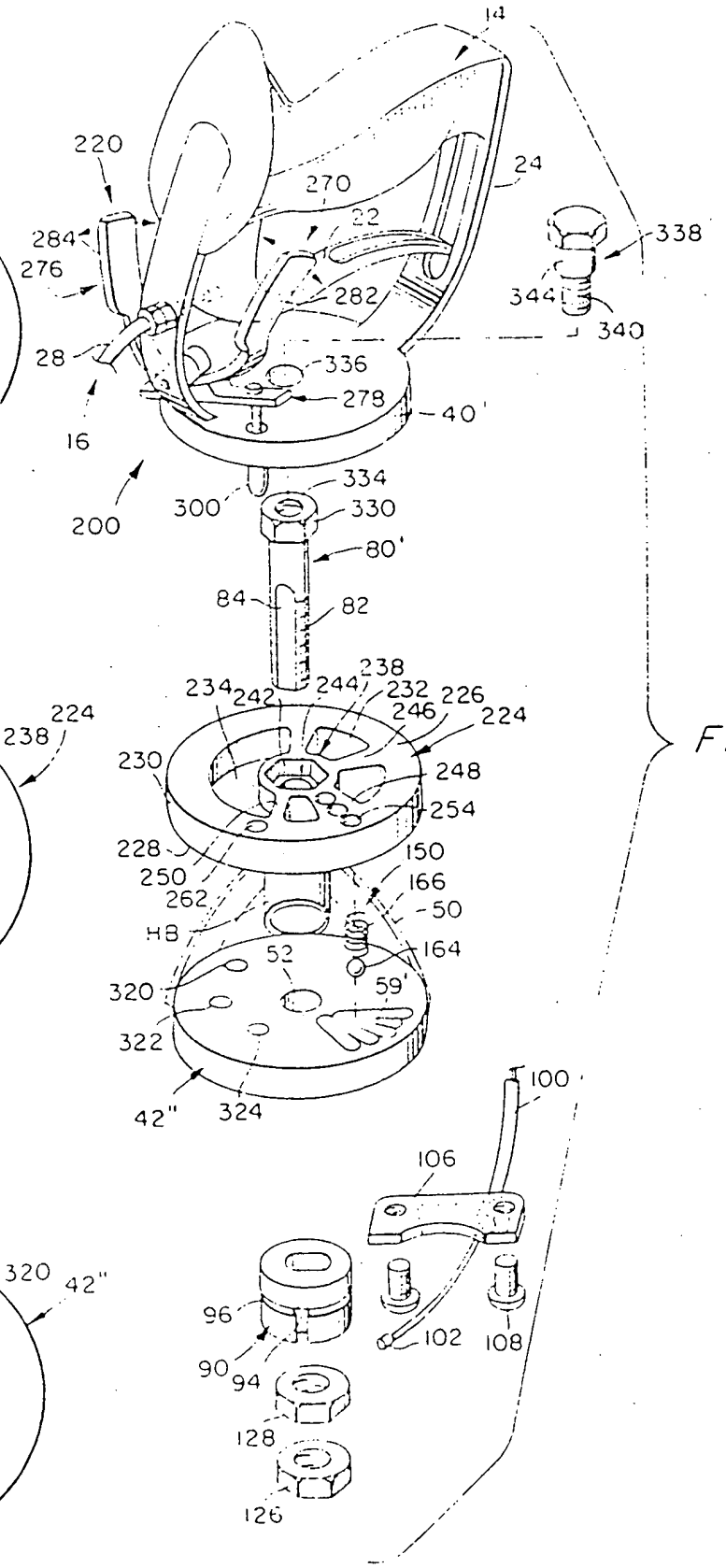


FIG. 7.

FIG. 11.

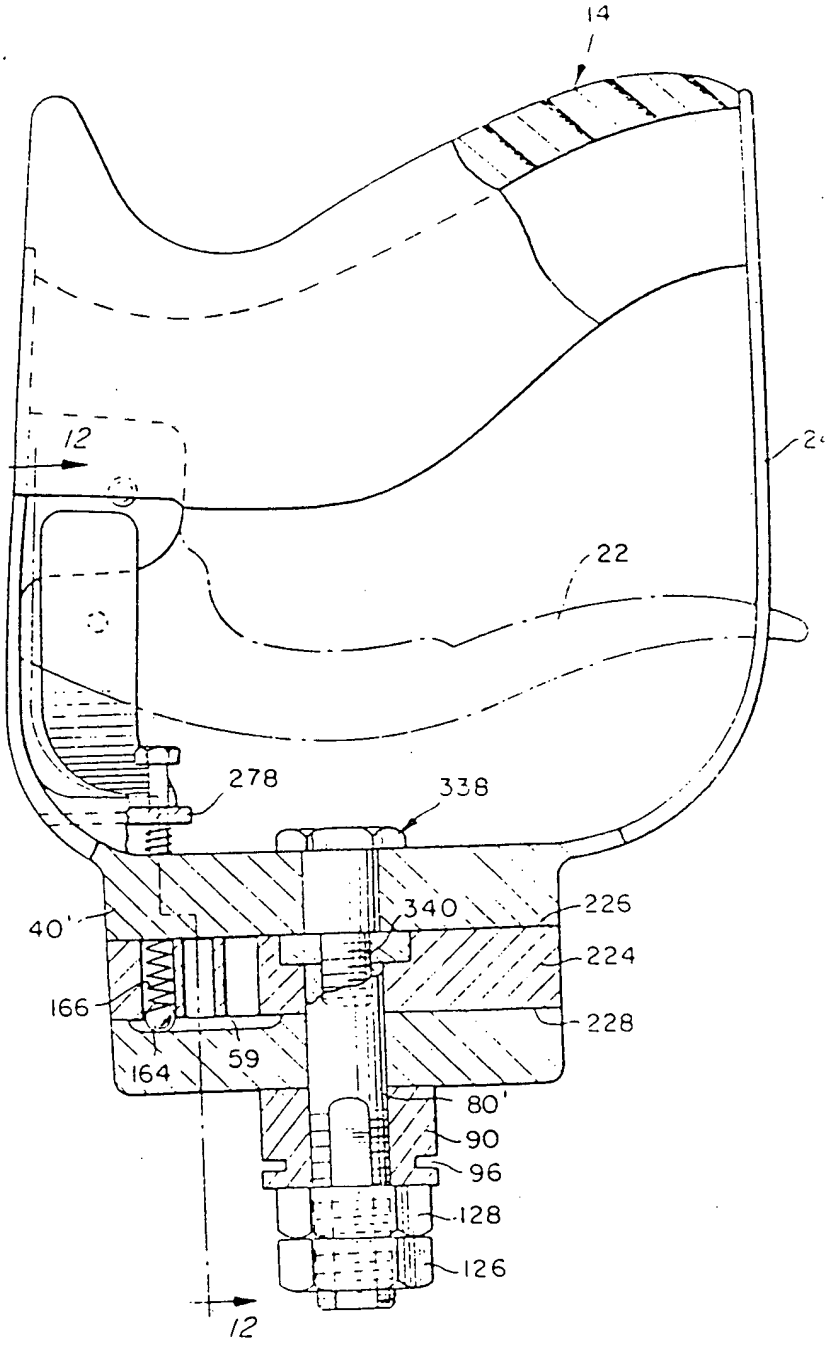


FIG. 12.

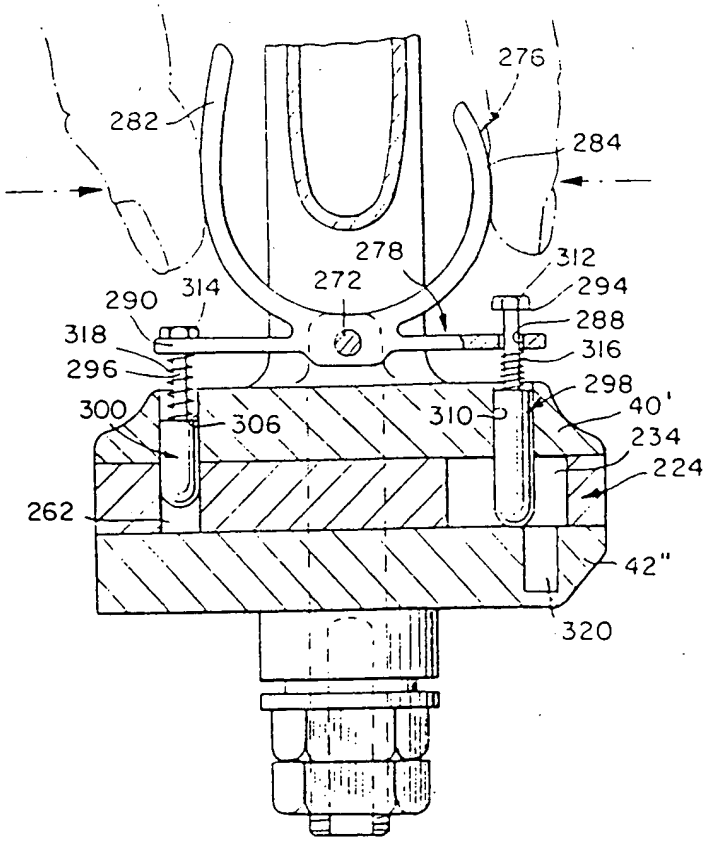
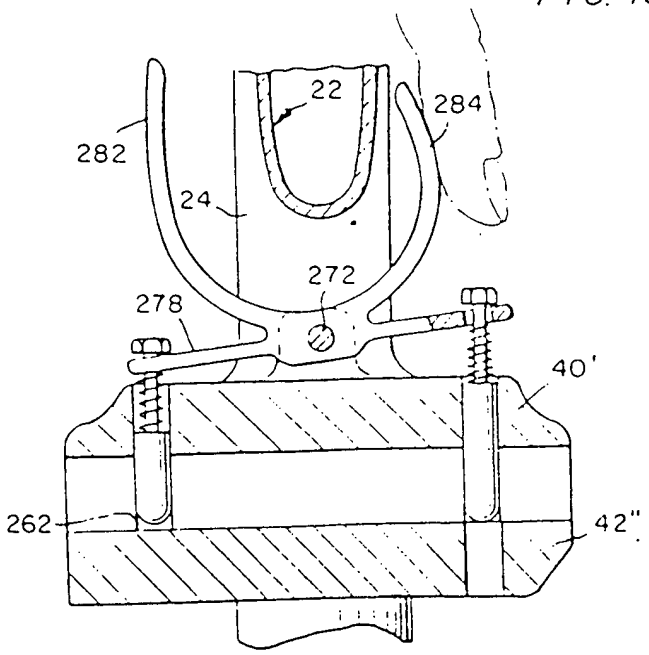

276
282
284
278
312
272
294
314
290
288
318
316
296
298
300
306
310
40'
234
224
262
42"
320

FIG. 13.


22
284
282
24
272
278
40'
262
42"

SPECIFICATION

Bicycle gear shift unit

The present invention relates in general to land vehicles, and, more particularly, to bicycles.

The gear changing operation in a typical multi-speed bicycle requires the rider to remove his hand from the handle to operate the gear changing mechanism. This requirement induces an unsafe situation as some control of the bicycle is lost during such operation. Furthermore, when a cyclist is changing gears, he is not able to quickly operate a hand brake, should an emergency arise, the situation is exacerbated by the requirement that the cyclist has his hand removed from the bicycle handlebars during a gear change.

Accordingly, there is need for a gear changing mechanism which permits simultaneous control of speed change and braking which also permits a cyclist to maintain both hands on the handlebars.

The device embodying the teachings of the present invention permits a cyclist to effect a change of gears without removing either of his hands from the handlebars, or from a brake handle.

The device includes a stationary base affixed to the handlebars and a rotatable base fixed to a handle which is grasped by the cyclist. The gear shift disc is coupled to the rotatable base, and a movable detent mechanism is interposed between the rotatable base and the stationary base. The detent mechanism produces audible clicks when the handle is rotated to indicate the gear changes are being effected and also assists in control of the overall unit.

In one embodiment of the device, means is included for permitting the cyclist to move his hand to another position after effecting a gear change without further change of gears. This embodiment includes a clutch mechanism to releasably couple the handle to the gear shift disc via an intermediate base, then to release that handle from that intermediate base after the gear change has been effected.

As above discussed, the device embodying the present invention enhances bicycle safety. Also, this device enhances bicycle efficiency as both the brake and the gear change mechanism can be operated simultaneously. Thus, a cyclist can downshift while braking if required, and then immediately be ready to start out in a low gear after stopping, or start accelerating again in a low gear.

The device also has means for adjusting the sensitivity of the gear changing mechanism from a configuration requiring great strength but short movements to effect a gear change, to a configuration requiring little strength but large movements to effect the same gear change.

The handlebar is also adjustable to provide for rider comfort depending upon riding conditions.

The invention is described further, by way of illustration, with reference to the accompanying drawings, in which:

Figure 1 is a perspective of a bicycle front end having mounted thereon a gear changing unit in accordance with one embodiment of the present invention;

Figure 2 is a cross-sectional view of the gear changing unit of Fig. 1;

Figure 3 is an exploded perspective view of the gear changing unit of Fig. 1;

Figure 4 is a plan view of a stationary base of the gear changing unit of Fig. 1 with five slots thereon and which is used in conjunction with the two slot unit shown in Fig. 3 to produce a ten-speed bicycle gear unit;

Figure 5 is a plan view of an adjustable handlebar used in conjunction with the gear changing mechanism of the present invention;

Figure 6 is an elevational view taken along line 6–6 of Fig. 5;

Figure 7 is an exploded perspective showing another embodiment of the gear changing unit of the present invention;

Figure 8 is a plan view of a rotatable base used in the gear changing unit of Fig. 7;

Figure 9 is a plan view of an intermediate base used in the gear changing unit of Fig. 7;

Figure 10 is a plan view of a stationary base used in the gear changing unit of Fig. 7;

Figure 11 is an elevational view of the gear changing unit of Fig. 7; and

Figures 12 and 13 are elevational views of the gear changing unit of Fig. 7 showing operation of the clutch mechanism of that unit.

Referring to the drawings, shown in Fig. 1 is a hand unit 10 mounted on bicycle handlebars HB. The unit 10 includes a handgrip 14, a brake means 16 and a gear changing means 20.

The brake means 16 includes a hand operated brake lever 22 pivotably mounted on a yoke frame 24 and controlling a brake cable 26 positioned in a brake jacket 28. The brake lever operates brake units on the wheels of the bicycle in a known manner, and a grip jacket 30 mounted on the yoke permits a cyclist to comfortably hold onto the hand unit. The grip jacket can be moulded in several sizes to accommodate various cyclists and be releasably mounted on the yoke frame 24.

As best seen in Fig. 3, the gear changing means 20 includes a rotatable base 40 and a stationary base 42 or 42′. The prime location is used to indicate that one stationary base contains two step changes, while the other stationary base contains five step changes, with the bases combining to produce a ten-speed unit. The rotatable and stationary bases are both circular in peripheral shape and have

essentially equal outer diameters, and in the assembled configuration, the bases are coincident.

The stationary base 42, 42' is fixed to the handlebars by a stirrup frame 50 and is best seen in Figs. 3 and 4. This base 42, 42' includes a central hole 52 and mounting holes 54 and 56, the purpose of which will be evident from the discussion presented hereinafter. A plurality of trough-like slots 59 or 59' are defined in upper surface 58 of the stationary base 42 or 42' respectively. The slots 59, 59' are elongate and prolate in shape with arcuate ends 60 located adjacent to the other perimeter 62 of the base and converging ends 64 located adjacent to the central hole 52. Each of the slots 59, 59' aligns with a center point located adjacent to but spaced from the center of the stationary base 42, 42' to allow proper gear selection adjustment. The slots 59, 59' are oriented and located according to gear changing considerations which will be evident to those skilled in the art from the teaching of this disclosure. The stationary base also includes a lower surface 66.

The rotatable base 40 includes a lower surface 70 which is juxtaposed with the stationary base upper surface 58. An elongate slot 74 is defined in upper surface 76 to extend diametrically of the rotatable base 40. The slot 74 is shaped and sized to snugly receive the yoke frame 24. Fasteners 78 attach the yoke frame 24 to the rotatable base 40, or the frame 24 can be molded to the base 40, if suitable.

A bolt 80 is fixedly mounted to the base 40 to extend from rotatable base lower surface 70. The bolt 80 is located centrally of the rotatable base 40 to extend through stationary base central hole 52. The bolt 80 includes threads 82 and a pair of planar portions, such as flat 84.

The gear changing means 20 also includes a gear shift disc 90 which is cylindrical in peripheral shape with a cylindrical outer surface 92 having a keyhole 94 defined therein and a circumferential groove 96 extending circumambiently therearound and located adjacent to the keyhole 94. A shift cable 100 is received in the groove 96 and has an eye 102 thereon received in the keyhole 94. The cable 100 is mounted on the stationary base 42, 42' by mounting bracket 106 and fasteners 108. The cable 100 operates the derailleur gears of the unit. The disclosed embodiment uses pronation to shift gears via the gear cable 100. However, an opposite connection of the cable 100 to the shift disc 90 will use supination, if suitable.

A polygonal hole 120 is defined centrally of the shift disc 90 and receives the bolt 80 with the flats 84 of that bolt engaging planar sides 122 of the shift disc hole 120, so that the shift disc 90 is coupled to the rotatable disc 40 to rotate therewith. The shift disc 90 is held on the stationary base 42, 42' by a lock nut 126 and an adjusting nut 128 threadably attached to the bolt 80. The adjusting nut 128 engages the shift disc 90, which, in turn, engages the stationary base lower surface 66 and forces the rotatable base 40 against the stationary base 42, 42' via the bolt 80 with a predetermined amount of pressure. This pressure is selected to permit relative rotation between the bases, but to prevent the derailleur return spring from rotating the unit. The lock nut 126 maintains this adjustment.

The hand unit 10 includes a detent mechanism 150 which includes a mount 152 fixed to the rotatable base upper surface 76 by fasteners or the like extending through slots 153 and connecting to tapped bores in the rotatable base 40. The slots 153 permit the mount 152 to be moved on the rotatable base 40 as necessary. The mount 152 includes an internally threaded bore 154 defined centrally therethrough and which is axially aligned with a slot or elongated hole 156 defined through the rotatable base 40. The slot 156 is located superjacent the slots 59 and 59' so that bore 154 is also located superjacent such slots.

The detent mechanism further includes a detent ball 164 located in bore 154 and slot 156 and a compression spring 166 biasing the ball 164 towards the bases. A cap screw 170 is attached to the mount bore to capture the spring and ball in the bore 154.

The assembled unit is shown in section in Fig. 2, and attention is now directed to that figure. The detent ball 164 is biased into the slots 59 or 59', but can move from slot-to-slot by overcoming the bias of spring 166. The detent mechanism 150 can be used to assist the lock nut 126 in preventing the derailleur return spring from moving the bases 40 and 42. The slots 59, 59' thus serve as indexing means for the gear changing unit. Such movement results in audible clicks as the ball moves from slot-to-slot. As the handgrip 14 is rotated, the gear cable 100 is moved via the shift disc 90 thereby changing the gears. At each stop, the ball 164 is captured in a stop slot 59, 59' and held therein by the spring 166. Each slot 59, 59' is located to effect an appropriate gear selection via the cable 100. Rotation of the handgrip 14 is imparted to the shift disc 90 via the bolt 80, and this rotation is relative to the stationary base 42, 42' so the ball 164 moves relative to that base and the slots 59, 59' defined therein.

The arrangement of the slots 59, 59' in the stationary base 42, 42' and the detent mechanism 150 provide for the adjustment necessary for the difference in travel or swing of the different derailleurs presently on the market, and keep the rotational movement of the handgrip 14 within the comfort range.

The detent mechanism 150 has a base with slots 153 to allow for adjustment with regard

to degree of handle rotation. The detent mechanism 150 is off-center with regard to the rotatable base 40, so it can be turned around for additional adjustment. If the detent mechanism 150 is adjusted closer to the handle base pivot point, there is less degree of rotation of the handle, and as a result, there is less travel of the cable 100 in relation to its jacket resulting in less movement of the derailleur. If the mechanism 150 is adjusted further away from the handle base pivot point, there is a greater degree of rotation of the handle, and as a result, there is a greater travel of the cable 100 in its jacket resulting in greater movement of the derailleur. This allows for fine adjustment of the detent mechanism 150 so that the derailleur and detent mechanism can be in proper relationship. The detent mechanism 150 has a threaded cap 170 so that the spring tension on the ball 164 can be relieved, making assembly and disassembly easier.

The base shown in Fig. 4 contains five elongate slots 59′ and the base shown in Fig. 3 contains two elongate slots 59. However, other shapes of slots and numbers of slots can be used without departing from the scope of this disclosure. For example, the unit 10 associated with the cyclist's right hand can control five step gears and the unit 10 associated with his left hand can control two step gears on the pedal hub.

The slots 59, 59′ can be located so that the extent of rotation required to activate the shift discs and derailleurs is within the comfort range of the average cyclist's fore arm/wrist movement, that of pronation and supination.

Another embodiment of the hand unit of the present invention is illustrated in Figs. 7 to 13. The hand unit 200 permits a cyclist to change gears, then return his hand and arm to a comfortable position with respect to the handlebars while leaving the bicycle in the selected gear. The unit 200 includes a brake unit means 16, a handgrip 14, a shift disc 90 along with the associated adjusting nut 128 and lock nut 126. The shift disc is coupled to the rotatable base 40′ by a bolt 80′ which is similar to bolt 80. Further included with the unit 200 are a brake cable and gear cable as discussed above with respect to the embodiment of Figs. 1 to 4. A detent mechanism 150′ includes a detent ball 164 and a biasing spring 166 and registers with slots 59 or 59′ defined in the stationary base as above described during a gear changing operation as above described.

A stationary base 42″ is fixedly mounted on the handlebars by a stirrup 50, as above-described, and a rotatable base 40′ is fixed to the handle yoke frame 24 as above-described. Alternatively, the stationary base could be molded to directionally receive the handlebars.

The unit 200 includes a clutch mechanism 220 which permits the handle 14 to rotate the shift disc 90, and hence change the bicycle gears, then to be rotated with respect to the rest of the unit so a comfortable hand-arm position can be assumed after a gear changing operation has been effected.

The clutch mechanism 220 includes an intermediate base 224 having an upper surface 226, a lower surface 228 and an outer peripheral surface 230. The intermediate base 224 also has a plurality of cutouts 232 defined therein to reduce the weight of unit 200 and a lost motion slot 234 defined in the intermediate base about a central hub 238. A polygonal, preferably hexagonal, hole 242 is defined in the hub 238 and a central hole 244 forms a counterbore with the polygonal hole 242.

A plurality of spokes 246, 248 and 250 extend from the hub 238 to the rim, and a plurality of detent accommodating bores 254 are defined in the spoke 248 to be spaced apart radially on that spoke and to be located superjacent the gear changing slots 59, 59′ defined in the stationary base 42, 42′ as discussed with respect to unit 10. The detent bores 254 accommodate the detent ball 164 and spring 166 as discussed above with respect to the detent bore 154. The detent ball 164 and spring 166 are located in an appropriate one of the bores 254 according to the selectivity of gear changing movement required. As the bores 254 are spaced apart radially, moving the detent ball 164 and spring 166 to an outer bore provides greater selectivity than when the ball 164 and spring 166 are in an inner bore, and must be moved farther to effect the same gear change via the shift disc and gear cable. However, the inner location does not require as much strength to move as does the outer location.

A further hole 262 is defined through the intermediate base 224 adjacent to the outer peripheral surface 230. This hole 262 is defined as an index finger pin hole.

The clutch mechanism 220 further includes an operating mechanism 270 which is pivotally mounted on the yoke frame 24 by a pivot pin 272. The mechanism 270 includes a wishbone frame 276 and a lever arm 278 both of which are integral with each other. The frame 276 has a thumb side 282 and an index finger side 184 which can be respectively engaged by the thumb and index finger of a bicycle rider when that rider's hand is positioned on the unit handgrip 14. The lever arm 278 includes a pair of holes 288 and 290 which respectively receive stems 294 and 296 of a thumb lock pin 298 and an index finger lock pin 300. It is noted that the lever arm 278 is a first degree type lever and thus the index finger side 284 of the wishbone frame 276 is on the side opposite the index finger lock pin 300 with respect to the pivot pin 272 which serves as a fulcrum for

the lever arm 278.

The rotatable base 40' has an index finger lock pin receiving hole 306 and a thumb lock pin receiving hole 310 defined therein. The stationary base 42'' includes a plurality of thumb lock pin receiving holes 320, 322 and 324 located to receive the thumb lock pin the appropriate circumstances. The stems of the lock pins 298, 300 have threaded nuts 312 and 314 thereon to hold the pins 298, 300 in the receiving holes 320, 322, 324, and springs 316 and 318 surround those stems to influence movement of the lock pins into and/or out of the corresponding holes.

The intermediate base 224 is oriented with respect to the rotatable base 40' so that the thumb pin 298 is accommodated in the lost motion cutout 234 and the index finger lock pin 300 is accommodated in the hole 262 of the intermediate base 224.

The bolt 80' couples the intermediate base 224 to the shift disc 90 and includes a polygonal, preferably hexagonal, head 330 which is received in the polygonal bore 242 defined in the intermediate base hub. An internally threaded bore 334 is defined in the bolt 80' and axially aligned with a bore 336 defined centrally of the rotatable base 40'. A shoulder screw 338 couples the rotatable base to the bolt and includes a threaded shank 340 and a shoulder section 344. The shoulder screw 338 couples the rotatable base 40' to the intermediate base 224 while permitting relative rotation between those two bases.

The bolt 80' includes flats 84 to couple the bolt 80' to the shift disc 90 and thereby couple the shift disc 90 to the intermediate base 224 so that rotation of the intermediate base 224 produces corresponding rotation of the shift disc 90, and concomitant gear changes.

As is evident from the above, a gear change operation of the shift unit 200 includes coupling the handgrip-rotatable base combination to the intermediate base 224 via the index finger locking set, rotating the handle, and hence the shift disc 90, via the intermediate base 224 and bolt 80', then decoupling the handle-rotatable base combination from the intermediate base 224 by rocking the lever arm 278 to withdraw the index finger lock pin 300 from hole 262 on the intermediate base 224 and returning the handle to a comfortable orientation. When the intermediate base 224 rotates relative to the stationary base 42'', the detent ball 164 moves from one slot 59' to the next as described above. At all times, before, during and after the gear changing operation, the cyclist's hand remains on the handle 14, and hence the cyclist remains in complete control of the bicycle and can brake at any time without moving his hand.

For the sake of completeness, a complete gear change procedure will now be described for the embodiment of Figs. 7 to 13. Assuming the rider's hand is in most the comfortable orientation when that rider begins the operation, he first pushes the index finger side 282 of the wishbone frame 276 inwardly, thereby in effect compressing spring 318, and at the same time the thumb lock pin 298 is withdrawn from hole 320. This then allows unit 200 (rotatable base 40', handgrip 14 and brake unit 16) to be rotated by the rider until the index finger pin 300 is pushed into hole 262 by the compressed spring 318 which locks unit 200 with the intermediate base 224, thereby coupling the handle 14 to that intermediate base. This action also positions the thumb lock pin 298 in the lost motion slot 234 of the intermediate base 224 to move freely within that slot.

Once the handle 14 is coupled to the intermediate base 224, and hence to the shift disc 90, via the bolt 80', the handle is rotated. The detent mechanism 150 is moved relative to the slots 59' in the stationary base 42''.

Once the appropriate gear is selected, the rotatable base 40' is decoupled from the intermediate base 224 by pressing the wishbone frame 276 with the thumb, thereby rocking the lever arm 278 in the opposite direction and lifting the index finger lock pin 300 out of the hole 262 in the intermediate base 224. The rotatable base 40' is now free to rotate with respect to the intermediate base 224, which remains frictionally engaged with the stationary base 42'' due to the detent ball spring mechanism 150 and the force created by the lock and adjusting nuts 126, 128 on the bolt 80' in the hub 238 of the intermediate base 224.

The handle 14 is then returned to a comfortable position, and as the handle is rotated, the thumb lock pin 298 successively aligns with the thumb lock pin holes 320, 322 and 324 defined in the stationary base 42''. The lock pin holes 320, 322 and 324 in the stationary base 42'' are located so that at no time can the position lock pins drop into a lock pin hole alternately while merely moving the lock lever 278 back and forth. When the position lock lever 278 is depressed one way, the handle must be rotated for the next hole to be aligned and a pin dropped into place. When a comfortable position is sought, the thumb side of the wishbone frame 276 is pressed inwardly, thereby withdrawing lock pin 300 from hole 262 and compressing spring 316. The handle is now ready to be rotated to find a comfortable position. If lock pin 298 drops in an undesired hole, the wishbone frame 276 is pivoted in the other direction by pushing inwardly on the index finger side 284 to retract pin 298 so the handle can be rotated further. Once the handle is rotated so the pin 298 will not drop

in the undesired hole, the wishbone frame 276 is pivoted immediately by pushing inwardly on the thumb side 282 to compress spring 316 again and the handle is rotated further, thereby locking the rotatable base 40' to the stationary base 42'' via the thumb pin 298 extending through hole 310 in the rotatable base, lost motion slot 234 in the intermediate base 224, and hole 320 to 324 in the stationary base 42''.

As above described, the rider was never required to remove his hand from the bicycle handle during the gear changing operation, and hence the cyclist remained in complete control of the bicycle and was also able to keep his hand on the brake handle at all times during the gear changing operation. Also, as above, two units 200 can be used to produce a la ge variety in selection of gears.

The bases and other elements of these units are made of lightweight, yet strong, material and can be honeycombed or the like to decrease weight.

An adjustable handlebar is shown in Figs. 5 and 6 and includes a pair of telescoping sections 400 and 402 held together by a snap catch mechanism 406. The catch mechanism 406 includes a pin 410 which is received in holes 412 and 414 defined in the telescoping sections 400 and 402, and a pin biasing mechanism 416.The pin biasing mechanism 416 includes a housing 420 having a stem 424 extending through holes 426 and 428 defined in the telescoping sections 400 and 402 and a biasing spring 430 located within the housing and encircling the pin 410. A detent collar 434 prevents pin 410 from falling out.

Using the snap catch mechanism, by pressing inwardly on the snap catch 406 as indicated by arrows 436, a cyclist can orient and position the handlebars to alter his body position depending upon the type of riding desired, such as casual riding, or the like.

In summary of this disclosure, the present invention provides a novel gear shift unit for bicycles which is operated without the rider removing his hand from the handlebar grips. Modifications are possible within the scope of the invention.

CLAIMS

1. A gear changing mechanism for use on a bicycle, which comprises: (a) a stationary base adapted to be fixedly mounted on a handlebar of a bicycle and having an upper surface with a plurality of indexing means defined therein; (b) a rotatable base rotatably coupled to the stationary base for rotation relative thereto and having a handle fixed to an upper surface for rotation therewith; (c) a gear shift disc adapted to be coupled by a gear shift cable to appropriate gears on the bicycle and coupled to the rotatable base for rotation therewith by a bolt attached to the rotatable base and extending thro in the stationary base into engage the gear shift disc; and (d) fasten the bolt for securing the gear shif bolt.

2. An apparatus as claimed in which a detent ball and spring is a detent mechanism bore define rotatable base and in engagemer indexing means.

3. An apparatus as claimed which the indexing means inclu of elongate troughs.

4. An apparatus as claimed 3, in which a cap is provided o mechanism bore to hold the bal the bore.

5. An apparatus as claimed claims 2 to 4, in which a mour the rotatable base and the cap the mount.

6. An apparatus as claimec claims 1 to 5, in which the bol planar portion and the shift dis receiving the bolt and having a planar portion.

7. An apparatus as claime which the fastening means inc ing nut and a lock nut on the

8. An apparatus as claime claims 1 to 7 including a clut ing the rotatable base from th

9. An apparatus as claime which the clutch includes an base interposed between the stationary bases, and couplec for rotation therewith through release mechanism for detacl the rotatable base to the inte

10. An apparatus as clai in which the release mechan lever pivotally mounted on t actuating means fixed to the thumb lock pin attached to lever and an index finger lo the other, the index finger l received in an index finger l hole defined in the interme ple the rotatable base to th and the thumb lock pin pas motion hole defined in the and being received in a firs receiving hole defined in th the lock pin receiving hole that at no time can one of located in alternate lock pi without rotating the rotata

11. An apparatus as c further including a should the rotatable base to the i

12. An apparatus as c or 11, including a second receiving hole defined in t

13. An apparatus as c claims 10 to 12, in which

polygonal head and the intermediate base has a polygonal bore receiving the bolt head.

14. An apparatus as claimed in any one of Claims 10 to 13, including a second detent mechanism bore defined in the rotatable base.

15. An apparatus as claimed in any one of claims 10 to 14, in which a biasing spring is provided on each lock pin.

16. An apparatus as claimed in any one of claims 1 to 15, including a brake actuating mechanism mounted on the handle.

17. A gear changing mechanism for a bicycle substantially as hereinbefore described with reference to, and as illustrated in, Figs. 1 to 4 of the accompanying drawings.

18. A gear changing mechanism for a bicycle substantially as hereinbefore described with reference to, and as illustrated in, Figs. 7 to 13 of the accompanying drawings.

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